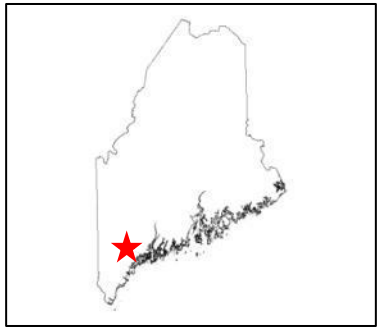
Geologic Site of the Month

September, 2002

The Geology of Sebago Lake State Park



43 55‘ 17.46“ N, 70 34‘ 13.07“ W

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Introduction

Sebago Lake State Park is located within the towns of Casco and Naples in southwestern Maine, approximately 23 miles (37 km) northwest of Portland. The park is sited along the north shore of Sebago Lake, Maine's second largest lake (after Moosehead Lake) (Figure 1). Sebago Lake State Park is one of the original five state parks and covers over 1400 acres. With sandy beaches, wetlands, woodlands, hiking and biking trails, and 250 campsites, it is a popular four-season destination.

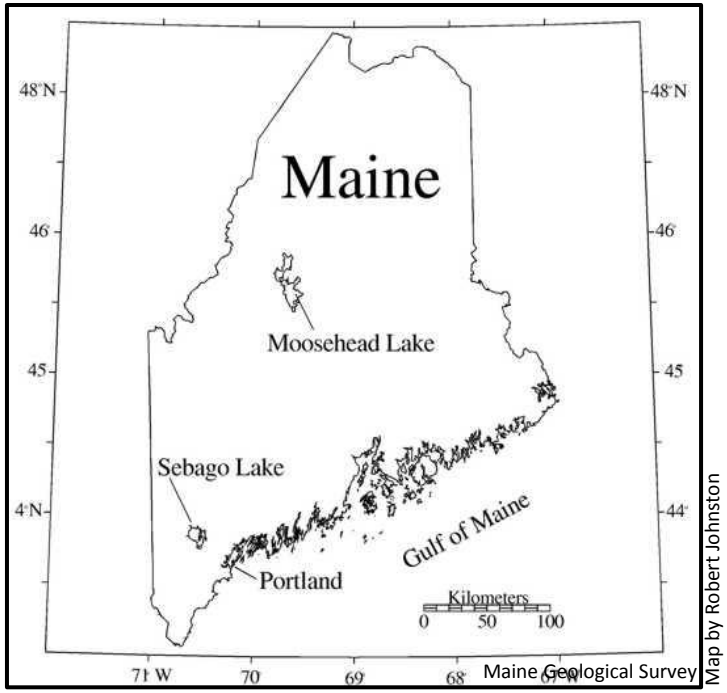

Figure 1. Location of Sebago Lake.

Introduction

Sebago Lake is Maine's deepest lake at 316 feet and has a surface area of over 47 square miles. Sebago Lake State Park is split by the Songo River which flows across a broad, flat valley (Figure 2). The Songo River valley is the most prominent geologic feature in the park.

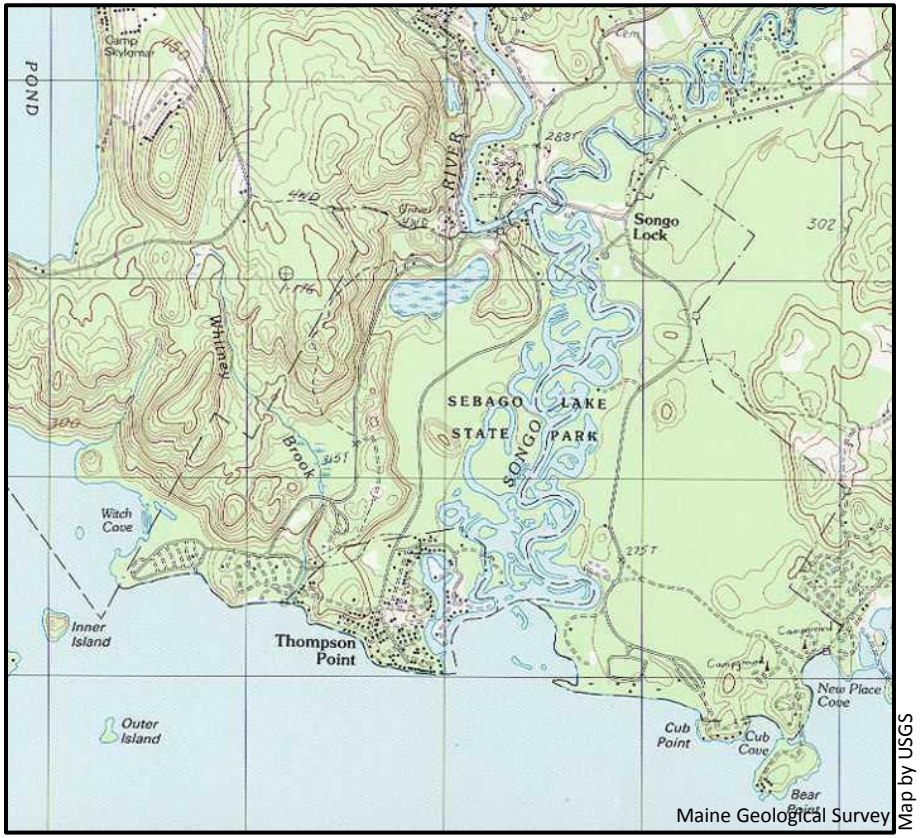

Figure 2. Portion of the Naples 1:24,000-scale topographic map showing the location of Sebago Lake State Park.

Introduction

From drilling records, it is known that, in places, sand and gravel is over 100 feet thick in the valley. The Songo River flood plain slopes about 10 feet per mile as the river drops from Songo Lock to Sebago Lake (Figure 3). These fine-grained sediments were deposited by streams and rivers.

Figure 3. Photo of old park road showing gradual slope of Songo River flood-plain surface.

Geologic History

Sebago Lake State Park's geology is influenced by (1) the resistance of the bedrock of the Sebago pluton, (2) the effects of glaciation; deposits left by ice, and (3) modern fluvial processes; wind, water and waves.

The granite that underlies Sebago Lake State Park is part of a large mass of igneous rock, emplaced in a molten state into older metamorphic rocks approximately 290 million years ago (Carboniferous Period). Gravity models of the batholith estimate a thickness of at least 1 km (Hayward and Gaudette, 1984).

Dikes, sheet-like intrusions of igneous rock, were emplaced into the Sebago granite during the Mesozoic Era (225 to 65 million years ago) and can be seen in the rocks at both ends of Witch Cove beach. These dikes are narrow, dark colored rocks that cut across the lighter colored granite. No known faults affect the area (Osberg and others, 1985).

Glaciers have covered the region multiple times during the Pleistocene Epoch (3 million years ago to 10,000 years ago), but all evidence of previous glaciations was removed by the most recent glaciation (approximately 30,000 to 12,000 years before present). Glacial striations can be seen on fresh outcrops along the shore of Sebago Lake and on bedrock outcrops in other areas of the park. The trend of ice flow in the region was generally towards the southeast, varying from 133 to 175 degrees (Hildreth, 1997).

Erosion of the granite by glaciers and water account for the great depth of water in the northern basin of Sebago Lake, just south of Sebago Lake State Park (see Why is Sebago Lake so deep?).

Bedrock Geology

The most common bedrock found within Sebago Lake State Park is granite of the Sebago pluton, an igneous rock (Figure 4). The color of the granite trends from white to pale pink. It is a fine-grained, light-colored granite composed mostly of the minerals quartz and feldspar with flecks of dark and light mica. When molten rock cooled to form the igneous rocks of the Sebago pluton, differences in fluid pressure caused small-grained and large-grained minerals to form.

Figure 4. Block of granite from the Sebago pluton.

Bedrock Geology

Large-grained granites found in the park are called pegmatites (Figure 5) and are composed of the same minerals as the granite. Bedrock outcrops in the park are more common at higher elevations, although outcrops can be found along the shore of the lake near Naples and Witch Cove beaches.

Figure 5. Large-grained pegmatite phase of the Sebago granite.

Glacial Geology

Sebago Lake State Park exhibits classic features of a glaciated terrain (Bloom, 1959). Found within the park are kame deposits, mound-like hills of sand and gravel; kettle holes, which form by the melting of large blocks of ice; and till, a heterogenous mixture of silt, clay, rock, sand and gravel. Examples of the kame and kettle features are found just east of the Naples Beach campground (Figure 6). Till covers most of the higher terrain in the park.

Figure 6. Sloping side of a kettle hole just east of the Naples Beach campground.

Glacial History

The last continental ice sheet melted back from the Sebago Lake region over thirteen thousand years ago. Due to the weight of the ice sheet the crust of the earth was depressed, allowing the ocean to advance inland of its present position and remain in contact with the retreating edge of the melting ice sheet. Sebago Lake, and much of the surrounding landscape, was submerged below sea level (Bloom, 1959). The inland limit of the ocean is drawn on the Surficial Geologic Map of Maine (Thompson and Borns, 1985). The inland marine limit boundary is based on the exposures of marine clay (called the Presumpscot Formation) along the shoreline of Sebago Lake near Whites Bridge and at the northern end of Jordan Bay. These low-lying clay deposits have evolved into the marsh environments found on the lakeshore today.

Till, the most common sediment found along the lake shore, was deposited in direct contact with the base of the ice sheet. It is a mixture of sand, silt and clay, and compaction makes it very resistant to erosion compared to other materials. Till is the oldest of the sediments found in the state park. Also deposited at the time of the continental ice sheets was the sand and gravel found in the kame and kettle topography.

The Holocene epoch, the warm climatic time period we live in today, began about 10,000 years ago. During this time, the reworking of glacial deposits by fluvial processes has been the dominant geologic process going on in the lake basin. Deposits of sand, gravel, till and fine-grained lake and ocean bottom sediments are continuously reworked by water moving over the landscape.

Modern Processes

Downcutting of the Songo River valley by the meandering river (Figure 7) has moved large volumes of sand and silt out into Sebago Lake. This continuous movement of materials out into the lake has formed the delta at the mouth of the Songo River. The Sebago Lake State Park day-use area beach is located on the surface of this delta.

Figure 7. Photo of down-cutting Songo River along day-use park entrance road. The river bank to the right is being eroded.

Modern Processes

The Songo River has migrated across the surface of the delta over time depositing material in lobes. Wind and waves have reworked that material into the environment we see today. The spit, located at the west end of the day-use beach (Figure 8), has migrated north over time and deposited sand and silt into a freshwater wetland. Longshore drift moves sand in a westward direction along Songo beach.

Figure 8. Photo of migrating sand spit from the west end of Songo Beach.

References and Additional Information

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